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phyceae are the next younger group of algae, descended partly from Rhodophyceae and partly from flagellate-like organisms. (5) The Zygophyceae are derived from flagellated ancestors, the Peridinales being most nearly related to the modern flagellates. (6) The Chlorophyceae are the youngest of the algae, and have come partly from Rhodophyceae and partly from flagellated ancestors. —S. YAMANOUCHI.

Sporangia and spores of Aneimia.—STEVENS[29] has investigated the development of the sporangia and spores in a species of *Aneimia*. He finds that the two tapetal layers break down at the mother cell stage, freeing the protoplasts and resulting in a tapetal plasmodium, as among the Ophioglossales. It was in connection with work on *Botrychium* (1906) that STEVENS proposed the excellent descriptive phrase "tapetal plasmodium." Perhaps it was a slip that he did not include this earlier paper in the "literature cited," or the still earlier paper of CARDIFF (1905). Upon the separation of the mother cells in *Aneimia* the plasmodium entirely surrounds each one. As each mother cell lies imbedded separately in the plasmodium, no wall is seen, and when the tetrad is formed the mother cell membrane persists about it. At the separation of the spores of a tetrad, the tapetal plasmodium flows between them. The author thinks that the thickness of the exine "is the work of the tapetal plasmodium." It is becoming more and more evident that in structure and behavior the Ophioglossales and Filicales belong together.—J. M. C.

Chromosomes in maize.—KUWADA[30] has studied the nuclear conditions in the pollen mother cells of nine different races of corn: red starch corn, yellow starch corn, amber rice popcorn, black starch corn, golden broach field corn, white flint corn, sugar corn, early light sugar corn, and red sugar corn. The number of gemini in these different races varies from 9 to 12, the sugar corns having generally a larger number than the starch corns. He thinks that the smaller number was reduced from 12, which is the original number for all the races of *Zea Mays*. The size and shape of the gemini in a figure differ, and there is present always a duplication of each of the gemini. In the equatorial plate of the homotypic division some pairs of chromosomes come in contact with each other. He suggests that the production of innumerable races of *Zea Mays* might have a certain relation to the duplication of chromosomes, resulting in the double number derived from the original form, which had probably 6 chromosomes as the reduced number.—S. YAMANOUCHI.

Botryopteris antiqua.—This interesting paleozoic fern, described by KIDSTON in 1908 from inadequate material, has been studied by Miss BENSON[31]

[29] STEVENS, WILLIAM CHASE, On the development of the sporangia and spores of *Aneimia phyllitidis*. Ann. Botany **25**:1059–1068. *pls. 84, 85.* 1911.

[30] KUWADA, Y., Maiosis in the pollen mother cells of *Zea Mays* L. Bot. Mag. Tokyo **25**:164–181. *pl. 6. figs. 4.* 1911.

[31] BENSON, MARGARET, New observations on *Botryopteris antiqua* Kidston. Ann. Botany **25**:1045–1057. *figs. 3. pls. 81–83.* 1911.

from a more abundant collection. The axis was rhizomatous, giving off numerous roots at intervals, and bearing two kinds of leaves, one set of petioles being supplied by a monarch leaf trace, and the other set by a diarch trace. The smaller leaves, supplied by the monarch trace, show at base a sheathing organ which is thought to represent the so-called aphlebia of *Zygopteris;* if so, this is the first record of the structure in *Botryopteris*, and further emphasizes the relationship of the two genera. BERTRAND'S view that the simple stele of *B. antiqua* is due to reduction and not to its primitive character is objected to. As the author says, "this view involves the assumption that the diarch type of petiole is older than the monarch, and the species (*B. antiqua*) is in process of simplification. This result is not easy to harmonize with the fact that later forms of *Botryopteris* petiole are triarch."—J. M. C.

Origin of transfusion tissue.—The so-called transfusion tissue of the leaves of gymnosperms has been recognized for many years as an anatomical feature of the group. WORSDELL (1897) suggested, on the basis of distribution and nature, that it is a modified centripetal xylem. Since the presence of centripetal xylem is an important fact in discussing evolutionary sequences, this view extended the range of recognizable centripetal xylem. Now Miss CARTER[32] has studied the beginnings of this tissue in the cotyledons, using 13 species, representing 9 genera of conifers. The conclusion is "that the first-formed transfusion tracheids appeared in such positions and were of such size as to make it appear improbable that they arose, in these organs at any rate, as an extension of the development of the centripetal wood." The evidence from a comparison with the other elements of the vascular strand suggests that "transfusion tissue" develops from the parenchyma.—J. M. C.

The causes of thorn development.—Since LOTHELIER conducted his researches on the experimental morphology of thorns, it has been generally believed that their development is favored and even caused by abundant light or by atmospheric desiccation. This was supposed to be the case particularly in the gorse, *Ulex europaeus*. ZEIDLER now calls these results in question,[33] for he is able to secure the development of thorns in *Ulex* both in partial darkness and in moist atmosphere. He regards the leafy shoots secured by LOTHELIER in moist air and in darkness merely as juvenile forms, whereas the thorny shoots are regarded as adult forms. It may be remarked that, even if further experiment should confirm the views of ZEIDLER, the real problem is in no wise touched by his experiments. It would still remain to determine why "juvenile shoots" should appear at some times and "adult shoots" at other times.—H. C. COWLES.

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[32] CARTER, M. GERALDINE, A reconsideration of the origin of "transfusion tissue." Ann. Botany **25**:975–982. *figs. 4.* 1911.

[33] ZEIDLER, J., Ueber den Einfluss der Luftfeuchtigkeit und des Lichtes auf die Ausbildung der Dornen von *Ulex europaeus* L. Flora **102**:87–95. 1911.